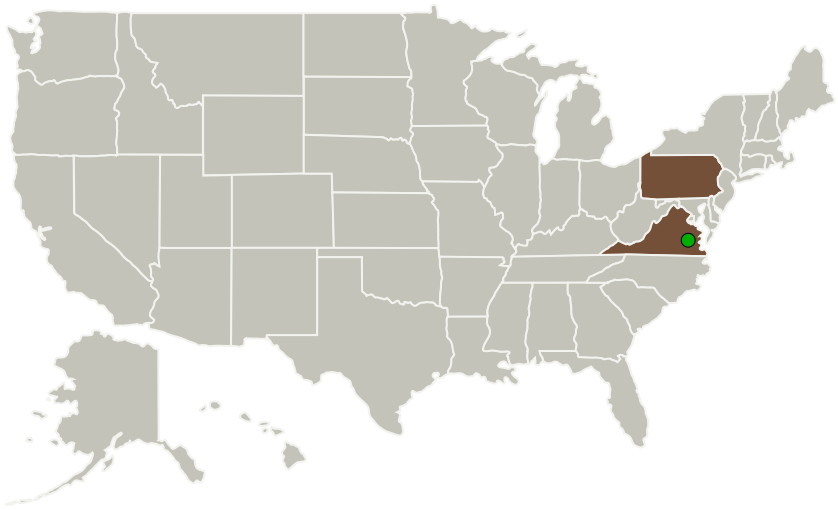
High Fidelity Simulation of Jet Noise Emissions from Rectangular Nozzles, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

The proposed SBIR Phase I & II programs will lead to the validation of a state-of-the-art Large Eddy Simulation (LES) model, coupled with a Ffowcs-Williams-Hawkings (FW-H) farfield acoustic solver, for supporting the development of advanced engine concepts, including innovative flow control strategies for attenuation of their jet noise emissions. The LES/FW-H model will be simultaneously validated against matched sets of flowfield and companion acoustic data acquired recently at NASA/GRC for round nozzles. The flowfield validation will include detailed comparisons against imagery, mean flow measurements and turbulence statistics. The end-to-end capability of the LES/FW-H noise prediction model will also be demonstrated by applying it to high aspect-ratio rectangular nozzle designs, proposed for testing at NASA GRC under the Fundamental Aeronautics Program. This critical validation will provide the foundation for proceeding to application of this innovative methodology in supporting the design and optimization of control concepts, e.g. chevrons, slot jets, fluidic chevrons, etc., as well as ultimately performing predictions of noise emissions from full-scale, realistic nozzles with complex exhaust flowpaths, airframe/propulsive jet interactions, etc.

Primary U.S. Work Locations and Key Partners



High Fidelity Simulation of Jet Noise Emissions from Rectangular Nozzles, Phase I

Table of Contents

High Fidelity Simulation of Jet Noise Emissions from Rectangular Nozzles, Phase I

Completed Technology Project (2011 - 2011)

Organizations Performing Work	Role	Type	Location
CRAFT Tech - Combustion Research and Flow Technology	Lead Organization	Industry	Pipersville, Pennsylvania
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Pennsylvania	Virginia

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140171)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CRAFT Tech - Combustion Research and Flow Technology

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Neeraj Sinha

Co-Investigator:

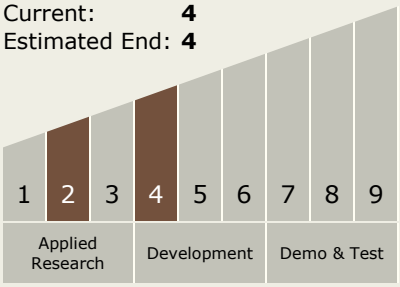
Neeraj Sinha

High Fidelity Simulation of Jet Noise Emissions from Rectangular Nozzles, Phase I

Completed Technology Project (2011 - 2011)

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.4 Aeroacoustics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System